Crypto Volatility and Risk Analyzer (Veloxis Quant)

Milestone 4: Final Project Submission

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Infosys Springboard Virtual Internship 6.0

The Need for Crypto Analytics

⚠ The Problem

Crypto markets operate 24/7 with extreme volatility, often leaving retail investors exposed.

- Lack of professional-grade risk quantification tools.
- Information overload from fragmented data sources.
- Difficulty in assessing true downside risk accurately.

◎ The Solution

A centralized **"Asset Intelligence Hub"** that translates complex market data into actionable risk scores.

- **Evolution:** Evolved from a basic Python script (Milestone 1) to a fully authenticated, secure Web Application (Milestone 4).
- Real-time data ingestion and visualization.

End-to-End Application Flow

User Layer

Secure Login & Registration via Streamlit UI. Authentication handling.

Logic Layer

Python Risk Engine & Monte Carlo Simulator processing market data.

Data Layer

CSV Ingestion for raw data & SQLite Database for user history.

Output Layer

Interactive Plotly Charts, Risk Gauges & PDF Audit Reports.

Powering the Platform

Core & Data

- **Python:** Core application logic.
- **Pandas & NumPy:** High-performance data manipulation.
- **Pandas-TA:** Technical Analysis library.

UI & Visualization

- **Streamlit:** Rapid web application framework.
- **Plotly:** Interactive financial charting.
- **Matplotlib:** Static plotting for reports.

Security & Utilities

- **Bcrypt:** Secure password hashing.
- **SQLite:** Lightweight database management.
- **FPDF2:** Automated PDF report generation.

Core Analytical Engine (Previous Development)

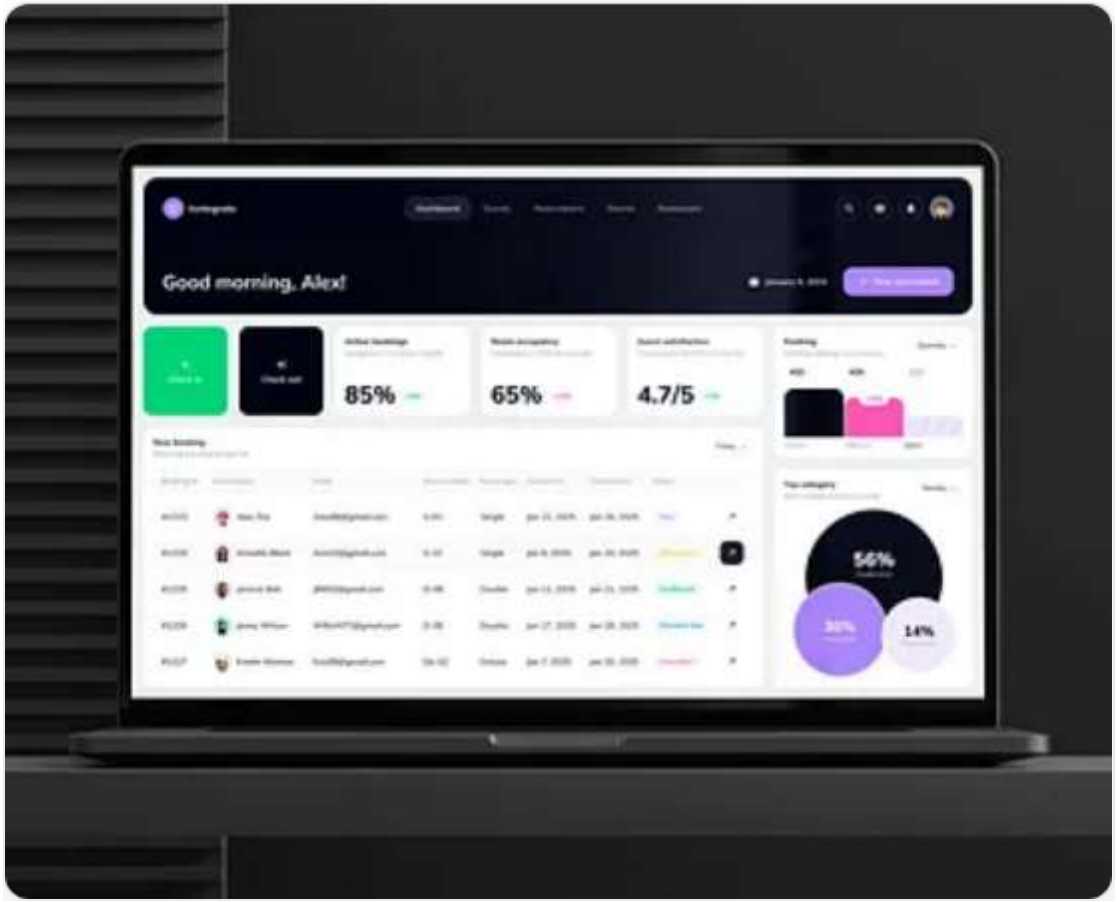
Data Ingestion Automated cleaning and structuring of raw CSV financial data to ensure consistency and reliability.

Volatility Logic Calculation of 30-Day Rolling Volatility and Daily Returns to establish a baseline for asset behavior.

Risk Logic Algorithmic determination of risk levels (Stable vs. Critical) based on standard deviation thresholds. This forms the mathematical backbone.

From Script to Platform

- **User Security:** Implementation of Authentication (Login/Register) and distinct Admin roles.
- **Predictive Modeling:** Replaced static testing with dynamic Monte Carlo Forecasts.
- **Comparative Analysis:** Added Divergence tools for multi-asset risk comparison.
- **Persistence:** Added "My Vault" for saving analysis history and strategic notes.
- **Reporting:** Automatic generation of downloadable, professional PDF Audit Reports.



User Authentication & Database

Security First

Ensuring data integrity and user safety was paramount in the final release.

- **Password Hashing:** All passwords are hashed using bcrypt before storage; never stored as plain text.
- **Session State:** Streamlit Session State securely manages user persistence across page reloads.

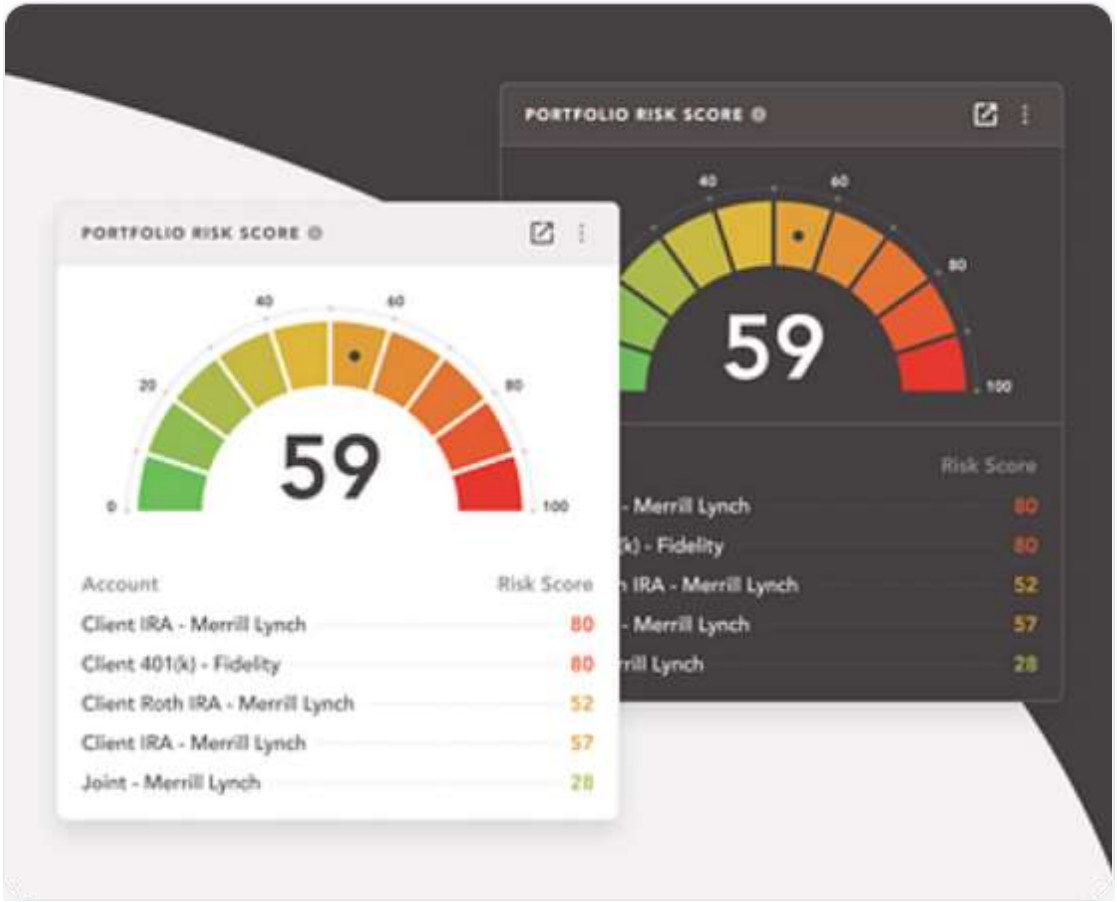
Role-Based Access

The system differentiates capabilities based on user level.

- **Standard User:** Full access to analysis tools, divergence metrics, and personal vault.
- **Admin:** Privileged access to system diagnostics, user history logs, and database purging tools.

Real-Time Observation & Export

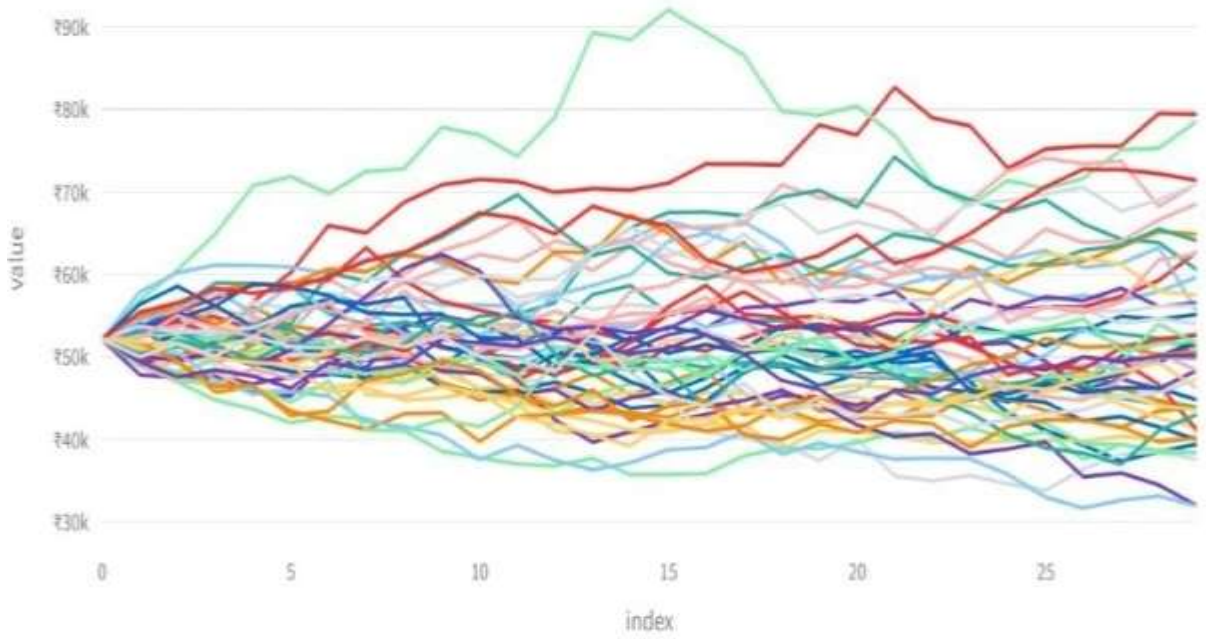
- **Interactive Dashboard:** Users select assets to view real-time price action and computed volatility scores instantly.
- **Visual Risk Gauge:** Custom HTML/CSS gauge showing the asset's current price position relative to its All-Time Low and High.
- **One-Click Audit:** Integrated fpdf2 generates professional PDF reports containing:
  - Risk Quantification Summary
  - Detailed Price Trend Analysis
  - Market Comparison Charts



Predictive Probability Engine

Instead of just looking backward, we project 30-90 days into the future using advanced simulations.

- **Methodology:** Uses geometric Brownian motion to simulate 1,000+ potential future price paths based on historical volatility.
- **Worst Case (5th Percentile):** Defines the "Floor" risk.
- **Median Case:** The most likely statistical outcome.
- **Best Case (95th Percentile):** The "Ceiling" potential.



Comparative Market Intelligence

Helps investors decide between a "Safe Haven" asset and a "High Growth" asset by visualizing the volatility gap.

**Example Data: Comparing standard deviation over the last 30 days.*

User-Centric Data Persistence

Strategic Vault

Users can save specific analysis results and attach custom "Strategic Notes" to them for future reference.

Database Integration

Seamlessly saves Timestamp, Coin ID, Risk Score, and User Notes to the integrated SQLite database.

History Management

Users have full control to view their historical calls and delete obsolete records directly from the UI.

Platform Oversight (Admin)

System Health

Real-time metrics on Database Size and performance.

User Oversight

View

Admins can view activity history of all users to monitor trends.

Maintenance

Capabilities to purge database history or reset system logs.

Conclusion & Future Scope

🏁 Project Outcomes

- **100% Completion:** Successfully delivered a secure, and analytical web application.
- **Impact:** Bridges the gap between complex Python data science and a user-friendly interface.
- **Milestone 4:** All functional requirements met with added security and persistence.

🚀 Future Scope

- **Live API:** Integration of live API keys (replacing CSV dependency) for real-time market data.
- **Alerts:** Email alerts for "Critical" risk levels.
- **Deployment:** Deployment to cloud hosting for public access.

THANK YOU

"We will now proceed with the Code Execution and Live Demo.